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09/451,256	11/29/1999	STEVEN R. HOLLASCH	MSI-448US	8802

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EXAMINER	
AMINI, JAVID A	
ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/451,256	Applicant(s) HOLLASCH, STEVEN R.
	Examiner Javid A Amini	Art Unit 2672

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *43-49* is/are allowed.

6)☒ Claim(s) *1-23,27-30,34-39 and 50-56* is/are rejected.

7)☒ Claim(s) *24-26,31-33 and 40* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim1-9, 12-14, 16-20, 27-30, 35, 37, 50-54 and 56 rejected under 35 U.S.C. 102(e) as being anticipated by Laferriere, patent US 6,226,005 B1.

1. As per claim 1, "defining a reference object relative to the represented object", Laferriere teaches in (col. 3, lines 13-16) that the reference object of, area of and weight of the intersection between each pixel in texture map and each polygon mesh, the weight corresponding to the proportion of said area of intersection relative to the total area of said pixel.

As for "determining the positions of the shapes relative to the reference objects using the characteristic data", Laferriere teaches in (col3, lines 18-21) for each determined area of intersection, determining the product of illumination information at determined location of intersection and the weight of area of intersection.

As for "determining, on the basis of the positions of the shapes relative to the reference object, those shapes that have no chance of intersecting the ray, and those remaining shapes that may intersect the ray", Laferriere illustrates in Figs. 5a-5m schematic representations of the categories of intersection which can occur between a triangular polygon in a tessellated polygon mesh and a square texture pixel.

2. As per claim 2, “The method of claim 1 further comprising using a predetermined algorithm to determine which one of those remaining shapes intersects the ray”, Laferriere teaches in (col. 6, lines 53-60) that the area of the intersection is determined using the algorithm described by Jon Rokne, on pages 5 and 6 of Section 1.1 of "Graphics Gems II", by James Avro, 1991, published by Academic Press, Inc, San Diego, Calif., the contents of which are incorporated herein by reference, and which only requires the coordinates of vertices of a polygon to be known in order to calculate the area of that polygon.

3. Claims 3-4, “The method of claim 1, wherein the collection of shapes comprises at least one or plurality of polygonal shape/s”, Laferriere teaches in (col. 2,lines 13-17) that the invention is not limited to use with meshes of triangular polygons and can be employed with polygons with more sides if desired.

4. Claims 5 and 6, “wherein the collection of shapes comprises at least one or plurality triangle/s”, Laferriere teaches in (col. 2,lines 13-17) that the invention is not limited to use with meshes of triangular polygons and can be employed with polygons with more sides if desired.

5. Claims 7-9, “The method of claim 1, wherein the collection of shapes comprises a triangle mesh/strip/fan”, Laferriere teaches triangle mesh in (col. 2, lines 4-8) and illustrates the triangle strip in Figs. 5, the next step triangle fan is obvious in triangle mesh.

6. Claims 12, 13, and 14 “The method of claim 1, wherein said determining the positions of the shapes comprises determining positional aspects of sub-components of individual ones of the shapes to provide the characteristic data”, “The method of claim 12, wherein the individual shapes comprise polygons and the sub-components comprise vertices that define the polygons, said determining the positions of the shapes comprising computing the positions of the vertices

relative to the reference object"; "the reference object comprises a plane"; Laferriere teaches in (col. 7-8, Lines 64-67;1-12) If non-triangular polygons are employed as the tessellation mesh polygons, such as rectangular polygons or the like, any suitable technique for determining position 168 and normal vector 172 can be employed, as will occur to those of skill in the art. For triangular polygons, the center of the area of intersection is first determined by summing the u component of each vertex in the area of intersection and dividing the result by the number of vertices to obtain the u coordinate of the center and by performing a similar process with the v components to obtain the v coordinate of the center. Next the barycentric coordinates are determined for the center of the area of intersection within the polygon, using the uv coordinate center determined above and the uv coordinates of the vertices of the polygon .

7. As per claim 16, "defining a collection of polygons that approximate an object, individual polygons having a plurality of vertices", "As for casting a ray toward the approximated object"; "defining a reference object relative to the collection of polygons and that contains the cast ray", "pre-characterizing at least some vertices of at least some of the polygons to provide characteristic data that describes the vertices position relative to the reference object; and using the characteristic data to ascertain the positions of the individual polygons relative to the reference object.", Laferriere teaches in (col. 1, lines 66-67; col. 2, lines 1-8) that in systems such as SoftImage.vertline.3D, it is known to reduce the computational complexity of rendering many 3D objects by tessellating 3D objects to obtain a polygon mesh representation of the defined 3D object and rendering the polygons in that mesh to obtain a reasonable approximation of the 3D object. Laferriere teaches in (col. 2, lines 18-20) rendering of objects represented by polygon meshes can be performed by scan line or ray tracing. Laferreiere teaches in (col. 3, lines 18-21)

determining the location of, area of and weight of the intersection between each pixel in said texture map and each polygon in said polygon mesh, the weight corresponding to the proportion of said area of intersection relative to the total area of said pixel. Laferriere illustrates in Fig. 3 and 4 the result of the projection of texture picture 40 onto tessellated representation 80 of 3D object 60. As an example, the vertices of polygon 108 are at (0.0, 0.5), (0.5, 0.0) and (0.5, 0.5). While in this example texture picture 40 was mapped entirely to object 60, it will be apparent to those of skill in the art that this need not be the case and that texture picture 40 can be cropped, if desired, such that only a rectangular region of interest of texture picture 40 is mapped to object 60. Laferriere teaches in (col. 9, lines 6-13) Once the values in data structures 140, and in their respective nodes 164, have been determined, the points of interest are rendered. Specifically, the scene definition is examined to determine the number of lights and their positions.

8. As per claim 17, "wherein the collection of polygons approximate the surface of the object", Laferriere teaches in (col. 1, lines 66-67; col. 2, lines 1-8) that in systems such as SoftImage.vertline.3D, it is known to reduce the computational complexity of rendering many 3D objects by tessellating 3D objects to obtain a polygon mesh representation of the defined 3D object and rendering the polygons in that mesh to obtain a reasonable approximation of the 3D object.

9. Claims 18 and 19, as for "wherein the individual polygons have a similar geometry; and wherein the individual polygons comprise triangles", Laferriere teaches in Fig. 3 and 4 the polygons comprise triangles and they have a similar geometry.

10. As per claim 20, "wherein the collection of polygons has a plurality of faces and a plurality of vertices, said faces outnumbering said vertices", Laferriere teaches in Fig. 3 and 4 the polygon has a plurality of faces and a plurality of vertices.

11. Claim 21 and 22, as for "wherein at least two of said polygons share at least one side; at least two of said polygons share is at least one vertex", Laferriere teaches in Fig. 3 the polygons share at least one side and at least two of said polygons share is at least one vertex.

12. Claim 27, Laferriere teaches in (col. 1, lines 66-67; col. 2, lines 1-8) that in systems such as SoftImage.vertline.3D, it is known to reduce the computational complexity of rendering many 3D objects by tessellating 3D objects to obtain a polygon mesh representation of the defined 3D object and rendering the polygons in that mesh to obtain a reasonable approximation of the 3D object. Laferriere teaches in (col. 2, lines 18-20) rendering of objects represented by polygon meshes can be performed by scan line or ray tracing. Laferriere teaches in (col. 3, lines 18-21) determining the location of, area of and weight of the intersection between each pixel in said texture map and each polygon in said polygon mesh, the weight corresponding to the proportion of said area of intersection relative to the total area of said pixel. Laferriere illustrates in Fig. 3 and 4 the result of the projection of texture picture 40 onto tessellated representation 80 of 3D object 60. As an example, the vertices of polygon 108 are at (0.0, 0.5), (0.5, 0.0) and (0.5, 0.5). While in this example texture picture 40 was mapped entirely to object 60, it will be apparent to those of skill in the art that this need not be the case and that texture picture 40 can be cropped, if desired, such that only a rectangular region of interest of texture picture 40 is mapped to object 60. Laferriere teaches in (col. 9, lines 6-13) Once the values in data structures 140, and in their

respective nodes 164, have been determined, the points of interest are rendered. Specifically, the scene definition is examined to determine the number of lights and their positions.

13. Claim 28, Laferriere teaches in abstract that the invention is used to determine the illumination values for one or more objects represented by a polygon (triangle) mesh.

14. Claims 29-30, Laferriere teaches triangle mesh in (col. 2, lines 4-8) and illustrates the triangle strip in Figs. 5, the next step triangle fan is obvious in triangle mesh.

15. Claim 35, Laferriere teaches in Fig. 3 the polygons share at least one side and at least two of said polygons share is at least one vertex.

16. As per claim 37, "defining a sub-set of polygons from a collection of polygons that approximate an object by determining which polygons have vertices that satisfy a predefined relationship relative to a reference object; and evaluating the sub-set of polygons to ascertain which of the polygons is intersected by a cast ray", Laferriere teaches in (col. 1, lines 66-67; col. 2, lines 1-8) that in systems such as SoftImage.vertline.3D, it is known to reduce the computational complexity of rendering many 3D objects by tessellating 3D objects to obtain a polygon mesh representation of the defined 3D object and rendering the polygons in that mesh to obtain a reasonable approximation of the 3D object. Laferriere teaches in (col. 2, lines 18-20) rendering of objects represented by polygon meshes can be performed by scan line or ray tracing. Laferriere teaches in (col. 3, lines 18-21) determining the location of, area of and weight of the intersection between each pixel in said texture map and each polygon in said polygon mesh, the weight corresponding to the proportion of said area of intersection relative to the total area of said pixel. Laferriere illustrates in Fig. 3 and 4 the result of the projection of texture picture 40 onto tessellated representation 80 of 3D object 60. As an example, the vertices of polygon 108

are at (0.0, 0.5), (0.5, 0.0) and (0.5, 0.5). While in this example texture picture 40 was mapped entirely to object 60, it will be apparent to those of skill in the art that this need not be the case and that texture picture 40 can be cropped, if desired, such that only a rectangular region of interest of texture picture 40 is mapped to object 60. Laferriere teaches in (col. 9, lines 6-13) Once the values in data structures 140, and in their respective nodes 164, have been determined, the points of interest are rendered. Specifically, the scene definition is examined to determine the number of lights and their positions.

17. As per claim 50, "A computer graphic processing system comprising: a processor; memory; and software code stored in the memory that causes the processor to implement a ray-intersection algorithm which: casts a ray at a collection of shapes that approximate an object; defines a reference object that contains the ray; pre-characterizes aspects of individual ones of the shapes of the collection to provide characteristic data; and uses the characteristic data to ascertain the position of the shapes of the collection of shapes relative to the reference object.", Laferriere teaches in (col. 1, lines 66-67; col. 2, lines 1-8) that in systems such as SoftImage.vertline.3D, it is known to reduce the computational complexity of rendering many 3D objects by tessellating 3D objects to obtain a polygon mesh representation of the defined 3D object and rendering the polygons in that mesh to obtain a reasonable approximation of the 3D object. Laferriere teaches in (col. 2, lines 18-20) rendering of objects represented by polygon meshes can be performed by scan line or ray tracing. Laferriere teaches in (col. 3, lines 18-21) determining the location of, area of and weight of the intersection between each pixel in said texture map and each polygon in said polygon mesh, the weight corresponding to the proportion of said area of intersection relative to the total area of said pixel. Laferriere illustrates in Fig. 3

and 4 the result of the projection of texture picture 40 onto tessellated representation 80 of 3D object 60. As an example, the vertices of polygon 108 are at (0.0, 0.5), (0.5, 0.0) and (0.5, 0.5). While in this example texture picture 40 was mapped entirely to object 60, it will be apparent to those of skill in the art that this need not be the case and that texture picture 40 can be cropped, if desired, such that only a rectangular region of interest of texture picture 40 is mapped to object 60. Laferriere teaches in (col. 9, lines 6-13) Once the values in data structures 140, and in their respective nodes 164, have been determined, the points of interest are rendered. Specifically, the scene definition is examined to determine the number of lights and their positions.

18. Claims 51, 52 and 53, Laferriere illustrates in Fig. 3 and 4 a collection of polygons, which have similar geometries. Laferriere teaches triangle mesh in (col. 2, lines 4-8) and illustrates the triangle strip in Figs. 5.

19. Claim 54, Laferriere teaches in (col. 6, lines 53-60) that the area of the intersection is determined using the algorithm described by Jon Rokne, on pages 5 and 6 of Section 1.1 of "Graphics Gems II", by James Avro, 1991, published by Academic Press, Inc, San Diego, Calif., the contents of which are incorporated herein by reference, and which only requires the coordinates of vertices of a polygon to be known in order to calculate the area of that polygon.

20. Claim 56, Laferriere illustrates in Figs. 3 and 4 the shapes of polygons and vertices of the polygons.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 10-11, 15, 36, 38-39 and 55 rejected under 35 U.S.C. 103(a) as being unpatentable over Laferriere, and further in view of Jenkins.

21. Claims 10 and 11, "wherein said reference object comprises at least one or plurality of planes each of which contain the ray", Laferriere dose not explicitly specifying plane or planes, but Jenkins illustrates in Fig. 6 and 8A plurality of planes. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Jenkins into Laferriere because this performance can be improved by employing pre-computed visibility sets which are lists of primitives that are potentially visible from specific regions of a 3-D database (col. 4, lines 15-20).

22. Claim 15, "the plane is parallel to one of the to x, y, and z axes", Laferriere dose not explicitly specifying a plane to be parallel to one of the x, y, or z axes. But Jenkins illustrates in Figs. 10 and 44 that a plane is parallel to one of x, y and z axes. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Jenkins into Laferriere, in order to process the scene definition faster or to process a more complex scene in a given time.

23. Claim 36, Laferriere dose not explicitly specifying a plane to be parallel to one of the x, y, or z axes. But Jenkins illustrates in Figs. 10 and 44 that a plane is parallel to one of x, y and z

axes. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Jenkins into Laferriere, in order to process the scene definition faster or to process a more complex scene in a given time.

24. Claims 38-39, Laferriere dose not explicitly specifying plane or planes, but Jenkins illustrates in Fig. 6 and 8A plurality of planes. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Jenkins into Laferriere because this performance can be improved by employing pre-computed visibility sets which are lists of primitives that are potentially visible from specific regions of a 3-D database (col. 4, lines 15-20).

25. Claim 55, Laferriere dose not explicitly specifying plane or planes, but Jenkins illustrates in Fig. 6 and 8A plurality of planes. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Jenkins into Laferriere because this performance can be improved by employing pre-computed visibility sets which are lists of primitives that are potentially visible from specific regions of a 3-D database (col. 4, lines 15-20).

Allowable Subject Matter

26. Claims 24-26, 31-33, 40 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

27. Claims 43-49 allowed.

Claim Rejections - 35 USC § 112

28. Claims 23, 34 rejected under 35 U.S.C. 112, second paragraph, as for "wherein none of said polygons share a vertex". Evidence that independent claim fails to correspond in scope of applicant in Paper (page 10, line 19) filed on 11/29/1999. In that paper, applicant has stated "other collections can be defined where none of the triangles share a vertex", the applicant has failed to illustrate or define how the above statement is applicable.

29. Claims 41-42 rejected under 35 U.S.C. 112, second paragraph, recite the limitation "computer graphic processing" in 37. There is insufficient antecedent basis for this limitation in the claim.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Javid A Amini whose telephone number is 703-605-4248. The examiner can normally be reached on 8-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Razavi can be reached on 703-305-4713. The fax phone numbers for the organization where this application or proceeding is assigned are 703-746-8705 for regular communications and 703-746-8705 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-0377.

Jeffery A. Brier
JEFFERY BRIER
PRIMARY EXAMINER

Javid Amini
December 16, 2002